

Percutaneous Endoscopic Discectomy

Clinical Results and How it Affects the Quality of Life

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Study Design: Prospective study

Objective: To determine the clinical outcomes and the effect on quality of life of patients with endoscopic discectomy.

Summary of Background Data: Percutaneous endoscopic discectomy is a relatively new technique. Very few studies have reported the clinical outcome of percutaneous endoscopic discectomy in terms of quality of life and return to the work.

Method: Fifty-five patients with percutaneous endoscopic discectomy performed from the year 2002 to 2006 had their clinical outcomes reviewed in terms of the North American Spine Score (NASS), Medical Outcomes Study Short Form-36 (SF-36) scores and Pain Visual Analog Scale (VAS) and return to the work.

Results: The mean age was 35.6 years, the mean operative time was 60 minutes and the mean length of follow-up was 3 years. The mean hospital stay for endoscopic discectomy was 17 hours. There was statistical difference in the reduction of severity of back pain and lower-limb symptoms (NASS and VAS, $P < 0.05$) at 6 months and 2 years. There was significant improvement in all aspects of the quality of life (SF-36, $P < 0.05$) scores except for general health at 6 months and 2 years postoperation. The improvement in the SF-36 quality of life parameters correlated with the improvement in the NASS back disability and neurogenic symptoms and the VAS leg and back pain scores. The recurrence rate was 5% (3 patients). The 5% patients (3 patients) subsequently underwent lumbar fusion for persistent back pain. All patients returned to their previous occupation after surgery at a mean time of 24 days.

Conclusions: Endoscopic discectomy is associated with improvement in back pain and lower-limb symptoms postoperation which translates to improvement in quality of life. It has the advantage that it can be performed on a day case basis with shorter length of hospitalization and early return to work thus improving quality of life earlier.

Key Words: endoscopic discectomy, discectomy, intervertebral disc herniation, lumbar spine

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The surgical treatment of lumbar disc herniation constitutes a large part of orthopedic practice and it has evolved considerably in terms of surgical technique and instrumentation.

Percutaneous endoscopic discectomy is a relatively new technique for removing lumbar disc herniation. It involves using an endoscope to visualize the disc removal. The discectomy is performed through a posterolateral approach by using specially developed instruments. The advantage of percutaneous endoscopic discectomy is that the disc is approached posterolaterally through the triangle of Kambin^{1,2} without the need for bone or facet resection thus preserving spinal stability.^{1–4} There is less damage to muscular and ligamentous structures allowing for faster rehabilitation, shorter hospital stay, and earlier return to function.

Although many studies^{1–8} have shown the efficacy of percutaneous endoscopic discectomy with good clinical outcomes, there are very limited reports of how this translates to quality of life improvement and ability to return to the work. Health-related quality of life measures which are patient-oriented (self-administered questionnaire) are important in evaluating neurologic and spinal disorders, especially as they affect the general status of the patients. It has even been suggested that more widespread use of standardized health measures may improve clinical practice.^{9,10}

The purpose of this study is to determine the outcome of percutaneous endoscopic discectomy in terms of the North American Spine Score (NASS),¹¹ Medical Outcomes Study Short Form-36 (SF-36) “Quality of Health” scores^{9,10} and Pain Visual Analog Scale (VAS), and how well patients have returned to the work.

MATERIALS AND METHODS

From the year 2002 to 2006, 55 patients with percutaneous endoscopic discectomy performed for herniated intervertebral disc at our institution had data collected prospectively. All the operations were performed by 2 surgeons.

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During the study period, patients who had radicular symptoms due to discogenic lumbar nerve root compression and failed conservative therapy and had the diagnosis of lumbar disc herniation made on magnetic resonance imaging were offered endoscopic discectomy. The patients were counseled that this is relatively a new technique and offered the alternative of open discectomy as well. The 55 patients agreed to have percutaneous endoscopic discectomy.

Data on patient demographics, operative time, length of hospitalization, postoperative complications, and how soon they returned to work were obtained. In our institution, all patients who underwent spinal surgery had routine preoperative assessment and 6 months and 2 years postoperative assessments carried out; the patients were assessed based on the NASS (disease specific questionnaire),¹¹ Medical Outcomes Study Short Form-36 scores (quality of life questionnaire),^{9,10} and VAS for pain (Table 1). All patients were evaluated by an independent observer not involved in the surgical procedure.

Statistical analysis was performed with the use of SPSS version 10.0. Categorical data were compared with the use of χ^2 test. Nonparametric statistics were used for the analysis of continuous variables when data were not normally distributed. Significance was defined as $P < 0.05$.

Technique

Preoperatively, all patients received 1 g of cefazolin intravenously as antibiotic prophylaxis and if the patient is allergic to penicillin, then 1 g of intravenous vancomycin was given instead. The patients were placed prone on a radiolucent operative table on a Wilson frame.

Thirty-six of the 55 patients (66%) were performed under local anesthesia. The skin, subcutaneous tissue, fascia, and muscle layers were infiltrated with 1% lignocaine. For relaxation and comfort of the patient, sedation with intravenous midazolam or Fentanyl was administered by the anesthetist. Nineteen patients (34%) were uneasy about having the operation performed under local

anesthesia and so the operation was performed under general anesthesia.

The skin entry point is usually about 8 to 12 cm from the midline. Under fluoroscopic guidance, an 18 gauge spinal needle is inserted such that the needle tip is positioned at the medial pedicular line in the anteroposterior projection and on the posterior vertebral line in the lateral projection. In patients, operation performed under local anesthetic, a transforaminal epidural infiltration with 1% lignocaine is injected through the spinal needle to reduce pain and discomfort. The needle is then punctured into the disc and an intraoperative discogram is performed with a mixture of 6 mL of contrast media and 1 mL of indigo carmine. The indigo carmine stains the pathologic nucleus and the annular fissure for easy discrimination through the endoscope.

A guidewire is then inserted through the needle into the disc and the needle removed. A small stab incision is made at the entry site of the guidewire and a tapered cannulated obturator is slid over the guidewire and introduced gently into the foramen and into the disc. A beveled working cannula is then introduced over the obturator, which is then withdrawn. An endoscope (Yeung Endoscopic Spine System-Y.E.S.S. endoscope)¹² is then inserted through the working channel and discectomy performed with endoscopic forceps. Hemostasis is performed with bipolar diathermy (Ellman International, Hewlett, NY).¹²

RESULTS

The mean age of the patients was 35.6 years (range: 15 to 68 y). There were 23 (41.8%) females and 32 (58.2%) males. The mean operative time was 55.8 min (30 to 100 min). The mean length of hospitalization was 17.3 hours (range: 6 to 24 h). The mean follow-up period was 3.4 years (range: 2.0 to 6.5 y). All patients who were working preoperatively returned to the work. The mean time to return to the work was 24.3 days (10 to 60 d). All returned to their previous occupation (Table 1).

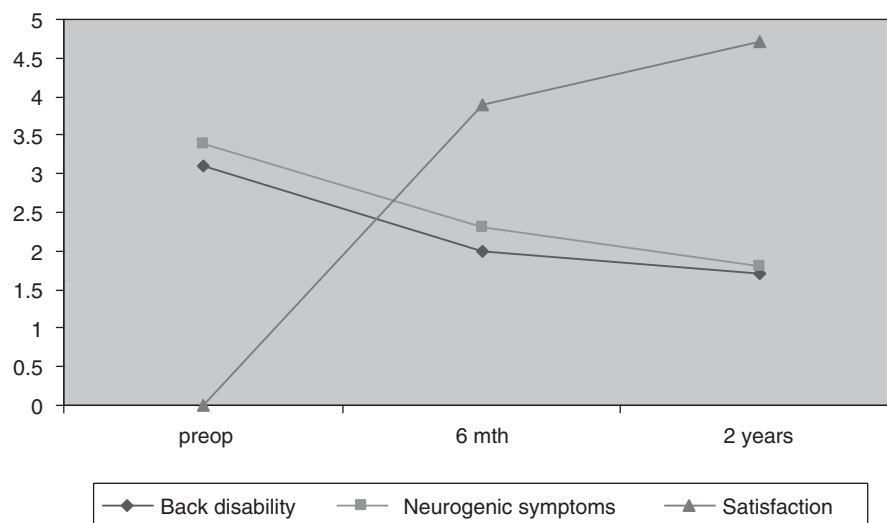
The 39 (70.9%) patients had L4L5 discectomy performed, 12 (21.8%) had L5S1, 2 (3.6%) had L3L4, and 2 (3.6%) had 2 levels L4L5 and L5S1 performed. There were 44 (80%) disc protrusions, 10 (18.2%) extrusions, and 1 (1.8%) sequestered disc.

Figures 1 and 2 shows the preoperative and 6 months and 2 years postoperative NASS and VAS scores. There was significant improvement in the NASS scores for back disability and neurogenic symptoms and the VAS scores for back pain and lower-limb pain at 6 months and 2 years postoperatively compared with preoperatively (all $P < 0.05$). The mean NASS score for satisfaction with treatment was 3.9 (range: 1.3 to 5.4) at 6 months and 4.7 (range: 2.5 to 5.8) at 2 years postoperation (1 = extremely dissatisfied, 6 = extremely satisfied).

On the basis of the SF-36 questionnaire (Fig. 3), all aspects of "quality of life" improved after endoscopic discectomy. At 6 months and 2 years postoperation, there

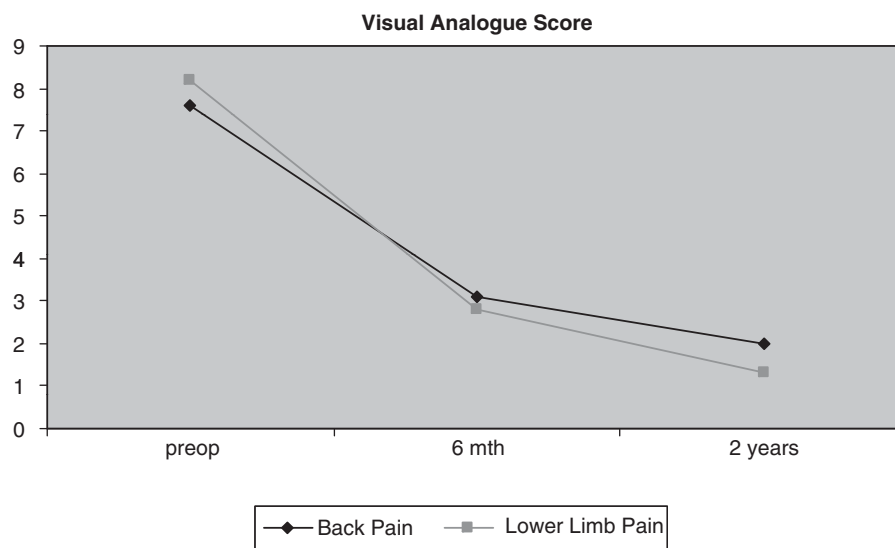
TABLE 1. Patient Demographics, Operative Time, Length of Hospital Stay, and Duration of Follow-up for Endoscopic Discectomy

	Endoscopic Discectomy
Age	Mean 35.6 y Range: 15-68 y
Sex	23 females: 32 males 42% females: 58% males
Operative time	Mean 55.8 min Range: 30-100 min
Length of hospital stay	Mean 17.3 h Range: 6 to 24 h
Follow-up	Mean 3.4 y Range: 2.0-6.5 y
Duration of medical leave	Mean 24.3 d Range: 10-60 d



	Back disability	Neurogenic symptoms	Satisfaction
preop	3.1	3.4	0
6mth	2	2.3	3.9
2years	1.7	1.8	4.7

FIGURE 1. NASS scores preoperatively and postoperatively. NASS indicates North American Spine Score.



	Back Pain	Lower Limb Pain
preop	7.6	8.2
6 mth	3.1	2.8
2 years	2	1.3

FIGURE 2. Visual Analog Scale preoperatively and postoperatively.

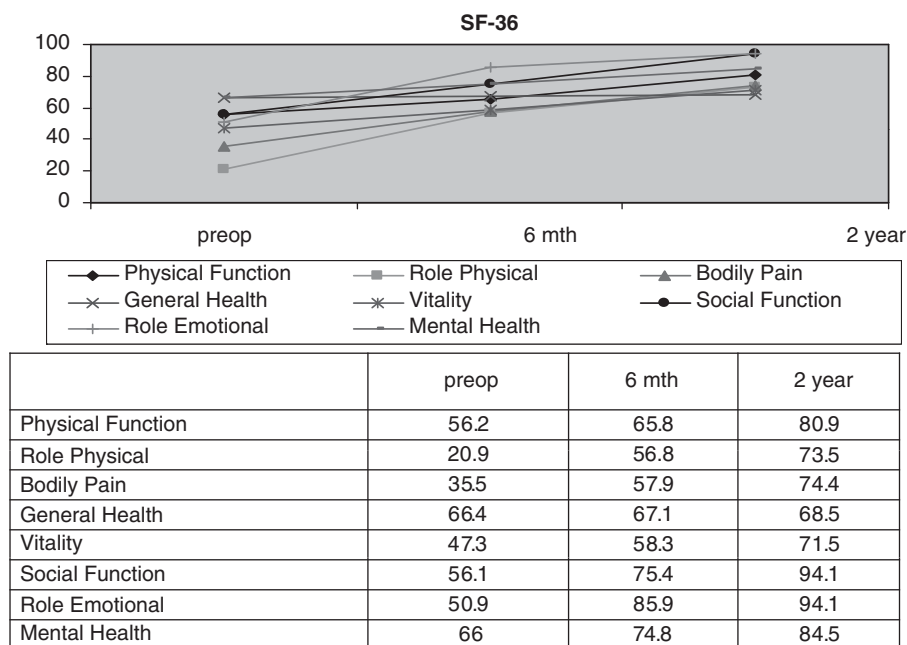


FIGURE 3. SF-36 scores preoperatively and postoperatively. SF-36 indicates Short Form-36.

was significant improvement in scores for physical function, role physical, bodily pain, vitality, social function, role emotional, and mental health (all $P < 0.05$). However, the improvement in general health scores did not reach significant difference at 6 months and 2 years postoperation.

Three patients had recurrent disc prolapse (recurrence rate 5%) of which 2 were treated with open discectomy and 1 treated conservatively. One patient had a sequestered disc after endoscopic discectomy and was treated with open discectomy. Three patients (5%) subsequently underwent lumbar fusion for increasing back pain despite good relief of radicular symptoms after endoscopic discectomy. One patient developed discitis 4 days postendoscopic discectomy and was treated with endoscopic washout of the disc space and antibiotics. There were no complications associated with any of the subsequent surgeries performed after endoscopic discectomy.

DISCUSSION

Conventional open surgery remains the “gold standard” for treating herniated intervertebral disc. However, the disadvantages of open surgery include extensive retraction and dissection of paraspinal muscles, longer operative time, larger wounds, and bone resection.^{5,13}

Endoscopic discectomy via a percutaneous transforaminal posterolateral approach is an alternative technique used to treat lumbar disc herniations. Advances in instrumentation now allow for a “working channel” through which various tools can be passed under direct endoscopic visualization for the safe removal of disc material. The advantages of this technique include less paraspinal musculature trauma and smaller wounds.

Bone removal is not required to decompress the exiting nerve root and this avoids the risk of inducing spinal instability.^{2,3,14} Also the spinal canal is not violated and therefore there is less epidural bleeding and epidural scarring. However, unlike other percutaneous techniques such as chymopapain chemonucleolysis, percutaneous laser discectomy, and nucleoplasty, percutaneous endoscopic discectomy allows removal of not only fragments located in the center of the nucleus, but also fragments that have migrated posteriorly and posterolaterally by using specially designed straight, upbiting, and deflectable forceps under endoscopic control.

Many studies have shown good to excellent clinical outcomes after percutaneous endoscopic discectomy based on improvement in disease-related symptoms and physical signs.³⁻⁸ However, these are surgeon-based outcome measures which are not related with validated measurements of outcomes those are more relevant to patients' quality of life and functional status. These measures place no emphasis on the patient's overall perception of the impact of the operation on subjectively experienced distress or well-being. To assess the impact on quality of life in patients who undergo percutaneous endoscopic discectomy, the SF-36 questionnaire was administered to our patients preoperatively and at 6 months and 2 years postoperation. On the basis of the SF-36 questionnaire, all aspects of “quality of life” scores improved after endoscopic discectomy compared with preoperation. There was also significant improvement in NASS and VAS scores at 6 months and 2 years postoperation compared with preoperation. Thus, back pain and neurogenic symptoms are particularly disabling and are associated with significant morbidity affecting quality of life. Hence surgical treatment to improve these symptoms translates

to significant improvement in the quality of life of patients.

In our study, the mean hospital stay for endoscopic discectomy was 17.3 hours. Other studies have also shown that endoscopic discectomy can be performed on an outpatient basis and discharged within 24 hours.^{13,14} The median hospital stay for patients treated with conventional open discectomy range from 3 to 4 days.¹⁵ Therefore, endoscopic discectomy has the advantage of shorter hospitalization compared with open approaches. In our study, the mean time to return to the work is 24.3 days and all patients returned to their previous occupation. Other studies also showed that the majority of patients were able to return to their previous occupation within 1 month, and that the period of disability is shorter for endoscopic discectomy compared with open discectomy.^{3,5,13} Thus, endoscopic discectomy is associated with short hospitalization and earlier return to the work and the patients can achieve improved quality of life earlier.

Most studies report that performing this procedure under local anesthesia with constant intraoperative feedback from patients is important in reducing the risk of neural damage.^{2,3,5-8,14,16} In our study, 66% of our patients were performed under local anesthesia and 19 patients were performed under general anesthesia. We feel that although the potential risk of nerve damage should be recognized, percutaneous endoscopic discectomy can still be performed safely under general anesthesia as long as the approach to the disc is kept within the triangle of Kambin.² However, this requires careful reading of the preoperative imaging studies and intraoperative fluoroscopy. Also when the endoscope is inserted, it is important to examine that the nerve is not entrapped. We felt that if the endoscope is introduced at the safe triangle of Kambin,² the risk of nerve damage was low. We did not have any neurological deficit in all the patients performed under general anesthesia. The advantage of general anesthesia is that there is no patient discomfort and intraoperative pain that is associated with performing the procedure under local anesthesia.

Three patients had recurrent disc prolapse (recurrence rate 5%), of which 2 had open discectomy. One patient was found to have a sequestered disc postendoscopic discectomy and had open microdiscectomy subsequently. Recurrence rate of lumbar disc herniation after open discectomy has been reported as 5% to 11% and most have been treated with a repeated discectomy through the same approach as the initial surgery.^{17,18} However, repeat open discectomy through the same initial approach could produce less satisfactory results with approach related complications. Scar tissue from the previous open surgery makes repeat discectomy more difficult with increased risk of dural tear or nerve injury.^{19,20} In our study, when open discectomy was performed for recurrent disc prolapse/sequestered disc after previous endoscopic discectomy, there was no scar tissue encountered and there were no associated complications. In these patients, the endoscopic procedure did not seem to have a disadvantageous influence on the

outcome of subsequent open surgery as all had resolution of their symptoms. Other studies^{5,14} also showed that successful outcomes can be achieved in repeat operations for failed percutaneous endoscopic discectomy.

Three patients subsequently underwent lumbar intervertebral body fusion for increasing low-back pain despite resolution of their initial radicular symptoms. Thus, although percutaneous endoscopic discectomy is effective in relieving leg symptoms, it is less effective in treating back pain and this has to be communicated to the patients.

In this study, the complications for endoscopic discectomy include 1 case of discitis and 1 case of sequestered disc, giving a complication rate of 3.6%. It has been reported that the overall complication rate for this kind of surgical procedure averages 2.6%.^{8,21} The complications reported include dyesthesia, nerve root or vascular injury, postoperative infections, and dural tear.^{6,8,12,16,21,22} The incidence of failures and complications in this group of patients was similar to that experienced with conventional open surgery.²⁰

CONCLUSIONS

Percutaneous endoscopic discectomy is a safe and efficacious technique to relieve symptoms of herniated discs and this improvement in back pain and leg symptoms translates to improvement in quality of life. It has the advantage that it can be performed on a day case basis with shorter length of hospitalization and early return to work thus improving quality of life earlier. This is important because patients become candidates for lumbar disc herniation surgery to obtain immediate pain relief and to improve their quality of life.

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